Agricultural Security: Vulnerabilities, Factors and Implications

Satellite Conference
Wednesday, August 24, 2005
12:00 - 1:30 p.m. (Central Time)

Produced by the Alabama Department of Public Health
Video Communications Division

Faculty

David Franz, DVM, PhD
Director, National Agricultural Biosecurity Center,
Kansas State University
Deputy Director, Center of Emergency Care and Disaster Preparedness,
University of Alabama at Birmingham

Dr. Marc Mattix
Montana Veterinary Diagnostic Laboratory
Bozeman, Montana

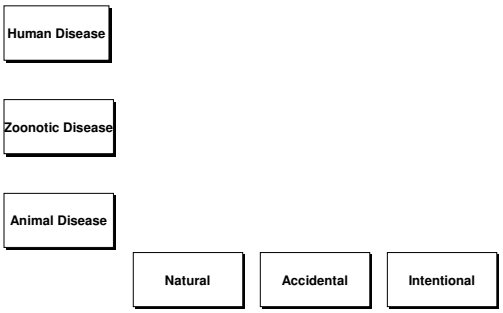
Objectives:

- To understand the complexity and vulnerability of our food production and distribution system.
- Understand the general categories of agents which might be used to disrupt the system.
- Understand the numerous factors affecting plant and animal health.

Objectives:

- Understand the role of animal health in National Security.
- Understand the social, economic, and political effects of a large-scale agricultural disaster.

The Biological 'Threat' Matrix:



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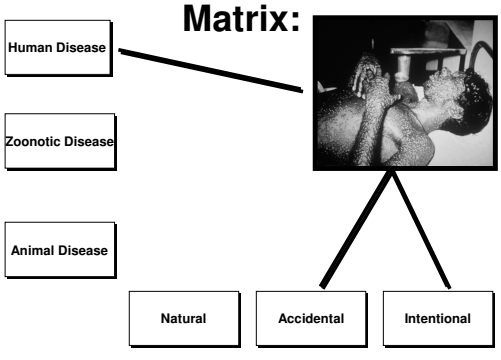

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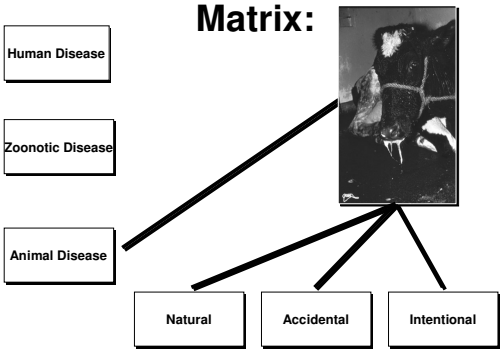

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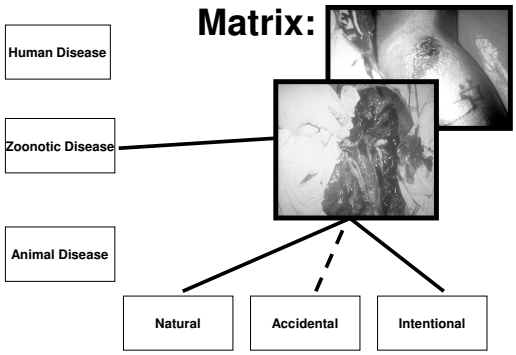

"The CDC List"

Category A "Special Action"

variola major
Bacillus anthracis
Yersinia pestis
botulinum toxin
Francisella tularensis
filoviruses
- Ebola
- Marburg

arenaviruses
- lassa
- junin

Category B "Specific Enhancements"

Coxiella burnetti
Brucella spp
Burkolderia mallei
alphaviruses
- VEE, EEE, WEE

ricin toxin
Clostridium perfringens, ε
SEB

Salmonella spp
Shigella dysenteriae
E. coli 0157:H7
Vibrio cholerae
Cryptosporidium parvum

Category C "Future Threats"

nipah virus
hantaviruses
tickborne HFVs
tickborne EVs
yellow fever
multidrug-resistant TB

Khan, Morse, Lillibridge
The Lancet, Vol 356, 2000

"The CDC List"

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- Variola major
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  - Ebola
  - Marburg
- Arenaviruses
  - Lassa
  - Junin

"The CDC List"

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"The CDC List"

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Category B
"Specific Enhancements"

Outliers...

C
E
Br
alphaviruses
VEE, EEE, WEE
ricin toxin
Clostridium perfringens, ε
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"Foreign Animal Diseases"

Rift Valley Fever
Peste des petis ruminants
Sheep Pox and Goat Pox
Avian Influenza
African Swine Fever
Bluetongue
Contagious Bovine Pleuropneumonia
Foot and Mouth Disease
African Horse Sickness
Lumpy Skin Disease
Rinderpest
Vesicular Stomatitis
Swine Vesicular Disease
Classic Swine Fever

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Swine Vesicular Disease
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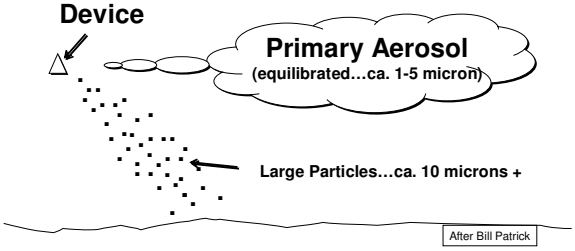
Wind →

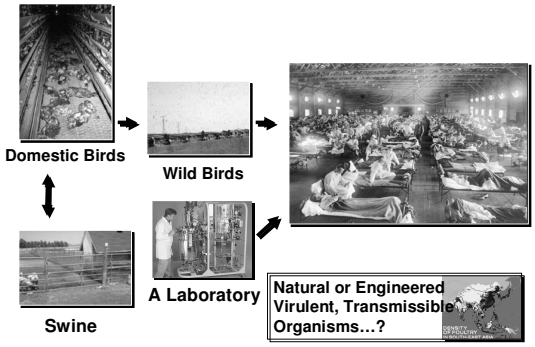
The Aerosol Cloud



After Bill Patrick

Newsweek, 5 Nov 01

Pandemic Influenza



The Dollar-Cost of Natural Outbreaks

- Taiwan FMD, 1997
- United Kingdom, BSE, 1996-2002
- United Kingdom, FMD, 2001
- Washington State, BSE, 2004

Food and Water Borne Bioterrorism/Biocrimes (1932 - Present)

‘96 - Diane Thompson--Dallas hospital
….*Shigella* in pastries (12 ill)
‘95 - Debora Green---Kansas City
….Ricin in meals (1 ill)
‘84 - Rajneeshees---Oregon
...*Salmonella* on salad bar (751 ill)
‘70 - Eric Kranz---Montreal
…*Ascriis suum* in food (4-5 ill)

<1200 ill & 16 dead

Food and Water Borne Bioterrorism/Biocrimes (1932 - Present)

‘66 - Dr. Mitsuru Suzuki---Japan
…*S. typhi* in food (ca.412 ill / 12 dead)
‘39 - Kikuko Hirose---Japan
…*Salmonella* in pastries (12 ill)
‘36 - Tei-Sabro Takahashi---Japan
…*Sal.* in pastries (10 ill / 4 dead)
‘32 - Prince Mikasa---Japan
…Cholera in fruit (0 ill)

<1200 ill & 16 dead

“Prior to September 11, 2001, all known victims of criminal use of biological weapons in the U.S. were exposed by the oral route --- with food as the vehicle.”

David Huxsoll
Jan. ‘02

The Background of Naturally Occurring Food-Borne Illness

- 75 million illnesses
- More than 300 thousand hospitalizations
- 5 thousand deaths
- A cost of $5-15 billion per year

Impact Of Plant Disease

- Southern corn leaf blight in US in 1970
  - $ 2 billion losses
- Potato late blight worldwide 1980s and 1990s
  - $ millions in US alone, fungicides obsolete
- The rice blast disease hits wheat in Brazil in 1985: Previously unknown on wheat
  - Now well established and causing serious losses

Emergence of Novel Strains of Indigenous Pathogens
Courtesy of Robert Zeigler

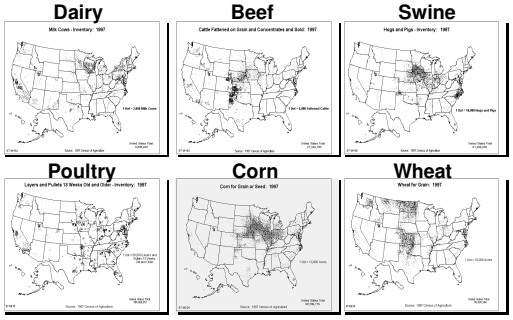
Direct National Impact on People

- Unlike the anthrax letters, a major agricultural attack would become very personal to the masses very quickly.

Population Desensitizes

- Today in Texas, Kansas or Nebraska
  - 50 thousand head in a mid-sized feedlot
  - 500 semi-truck loads to packer
  - 280 semi- loads finished beef
  - 160,000 boxes of beef
    - ~shipped to 50 countries

Regional Concentrations Increase Vulnerability



http://www.nass.usda.gov/census/census97/atlas97/

Vulnerability of Animals and Crops

- Free access
- Constant movement
- Little physical security
- Isolated rural areas
- Trusting people
- Infrequently monitored
- Transient workers

Transported Widely

- Animals and feed
- Highways and rail
- Unattended at truck-stops
- Difficult to track movement

Slim Profit Margins

- Agriculture not high-margin business
- Stiff domestic and foreign competition
- Land & equipment: major overhead costs
- Prophylaxis and security add to overhead
  - Unless risk is great---or measurable---can't afford
  - Grain farmer ~ 1 cent / bottle of beer
  - ~ 5 cents / $1 loaf of bread

The Current Solution: Cull and Destroy

- 20-30 K tons + / feedlot
- Carcass disposal
- Decontamination
  - FMD
  - BSE worst case

International Law and Vaccination (Foot and Mouth Disease)

- Vaccinating most of herd or flock protective.
- Vaccinated may still be "carrier", but not spread.
- There are now tests to tell vaccinated from infected.

International Law and Vaccination (Foot and Mouth Disease)

  - …but can't trade antibody positive animals internationally
  - OIE Regulations: 3 months after slaughter of last sick or vaccinated
    - ~12 months if vaccinated animals are not slaughtered
- Vaccine is killed, so can't cause disease

Social Issues

- Loss of wealth
- Whole communities
- Food safety and availability
- Emotional ties to animals
- Reticent to report
- Activist groups
- Trust in government

International Cargo (Potential for Introductions)

- Annually in the U.S.
  - 7,500 vessels
  - 51,000 port calls
  - 6,000,000 Containers
  - Quadruple in next 20 years
- CA 2% inspected in '02
- 20% of our imports are food

What Causes "Terror"?

- FMD in cattle
  ...Last in '29
- Emerging plant pathogen or pest
  ....relatively common
- Botulinum toxin in human food
  .....never intentional
- A zoonotic arbovirus
  ......WNV in '99

Is It Natural or Manmade?

- Disease not typically occurring in area
- Arboviruses; may be difficult to differentiate
- Multifocal outbreaks
- Serial outbreaks

Bioterrorism Is About Killing Humans

Agroterrorism is not about killing cows…

It's an economic assault on our national security and infrastructure!

After Jerry Jaax

American Prosperity...

"Our ability to produce safe, plentiful, and inexpensive food creates the discretionary spending that drives the American standard of living."

Dr. Jon Wefald
President, KSU

Courtesy Jerry Jaax

The Value of Awareness

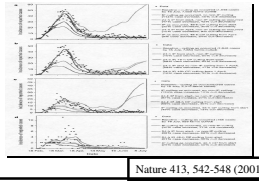
- Most veterinarians not familiar with FADs
- "Dr. to patient ratio" low
- Animals and plants seen by lay employees
- "Awareness" low-cost and effective

Importance of Early Identification

~ EQUAL

- Rapid, complete culling:
  - Infected premises
  - Farms with dangerous contacts
  - Contagious premises
- Movement restrictions and biosecurity

"…the epidemic could have been substantially reduced in scale had the most efficient control measures been rigorously applied earlier."



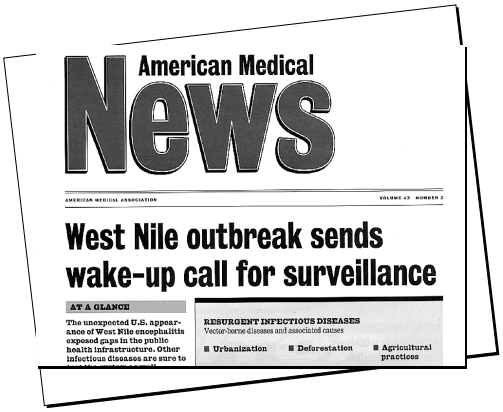
Nature 413, 542-548 (2001)

75% of Emerging Infectious Diseases are Zoonotic

It may not be only dollars at risk…

Nipah Virus in Malaysia

- 265 human cases with over 100 deaths
- Nearly 1,000,000 pigs destroyed
- Produced panic in civilian populations
- Enormous economic loss



American Medical News

AMERICAN MEDICAL ASSOCIATION VOLUME 43 NUMBER 3

West Nile outbreak sends wake-up call for surveillance

AT A GLANCE

The unexpected U.S. appearance of West Nile encephalitis exposed gaps in the public health infrastructure. Other infectious diseases are sure to

RESURGENT INFECTIOUS DISEASES

Vector-borne diseases and associated causes

- Urbanization
- Deforestation
- Agricultural practices

We Must Discover Disease:

- As early as we possibly can
  - The sooner, the better
- In the host or index species
  - It may not be a human, a cow or a duck
- In the geographic location of origin
  - It may not appear in the U.S. first

As Early As Possible…

- Animal, plant or human disease
- Naturally or intentionally introduced
- Discovery nearest the index case

In The Host or Index Species

- Not all human diseases start in humans
  - HPS (1991) – rodents
  - WNV (1999) – wild birds or mosquitoes
  - Plague in NM – rodents (domestic cats)
  - Monkey Pox (2003) – imported rodents
  - SARS (2003) – civet cats
  - H5-N1 (1997+) – pigs, birds and fowl
  - Tularemia in Texas – prairie dogs

In The Region Of Origin

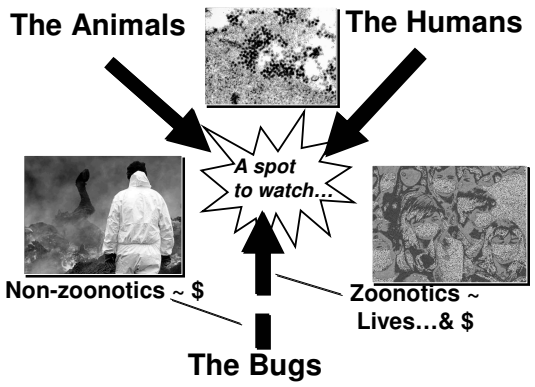
- It's a new, small world
  - More travel
  - …to more places
  - …more quickly
  - Animal and human population densities

The Way Ahead

- We're vulnerable
  - Close or reduce gaps
- Risk and threat???
  - HUMINT
- Not all "impacts" are equal
  - Prepare for the most important, feasible scenarios
- Exploit bio-, cyber- and electronic-technologies
- But don't ignore common sense solutions
  - Education, physical security and early diagnosis

Priorities

- ID attack our outbreak and confirm agent
- Develop case definition
- ID exposed animals, foods or humans
- Control movement
- Isolate, slaughter and dispose of animals
- Vaccinate or treat around outbreak
- Track and recall food
- Inform and educate the public



Finding Disease Early:
…too important to let politics or borders get in the way…

Strategic Context

- Post-Cold War Era
  - End of bipolar global geopolitics
  - Diffusion of state power
  - Failed nation-states
  - Regional instability
  - Geopolitical, social, religious, and ethnic fracture
  - Transnational dangers
  - CBRNE threats
  - Urbanization
  - Refugee flow

Strategic Context

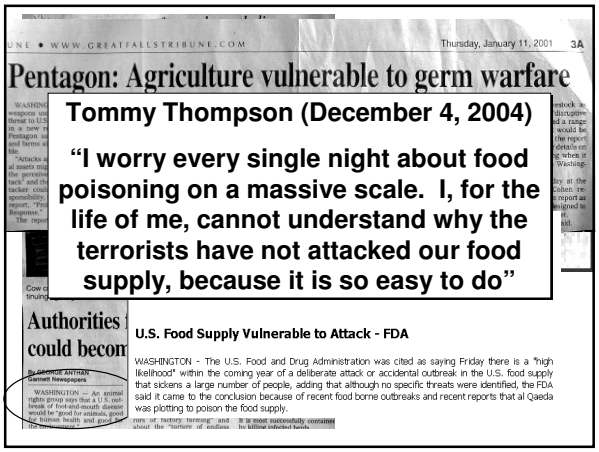
- Era of Globalization
  - Technological explosion
  - Information
  - Communications
  - Transportation
  - "Superempowered" individuals
  - Explosion of EIDs
- Bottom line
  - We have no peer competitors
  - Asymmetric application of power

Instruments of State Power

- Political/diplomatic
- Economic
- Military
- Social

Agroterrorism

- Attack on nation's agricultural industry
- Farm to fork continuum
- Animal vs human health
- Animal health is an issue of national security
  - Mother nature
  - Intentional
  - Unintentional introduction



UNE • WWW.GREATFALLSTRIBUNE.COM Thursday, January 11, 2001 3A

Pentagon: Agriculture vulnerable to germ warfare

Tommy Thompson (December 4, 2004)

"I worry every single night about food poisoning on a massive scale. I, for the life of me, cannot understand why the terrorists have not attacked our food supply, because it is so easy to do"

Authorities
could becom

By GEORGE ANTHAN
Gannett Newspapers

WASHINGTON — An animal rights group says that a U.S. outbreak of foot-and-mouth disease would be "good for animals, good for human health and good for

U.S. Food Supply Vulnerable to Attack - FDA

WASHINGTON - The U.S. Food and Drug Administration was cited as saying Friday there is a "high likelihood" within the coming year of a deliberate attack or accidental outbreak in the U.S. food supply that sickens a large number of people, adding that although no specific threats were identified, the FDA said it came to the conclusion because of recent food borne outbreaks and recent reports that al Qaeda was plotting to poison the food supply.

rors or factory farming" and about the "torture of endless
It is most successfully contained by killing infected herds.

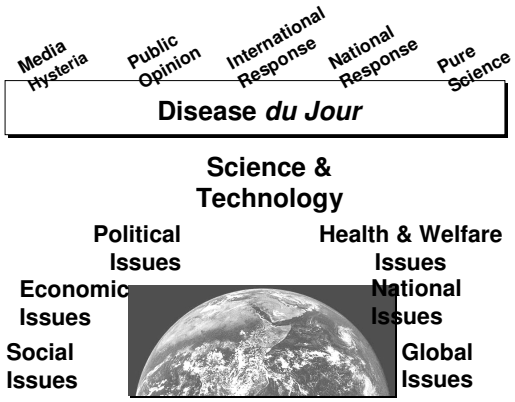
The Nature of A Biologic Attack

- An unnatural epidemic of an EMERGING INFECTIOUS DISEASE
- An outbreak of a FOREIGN ANIMAL DISEASE

- Anthrax
- Brucellosis
- Chlamydia
- Cholera
- Glanders
- Plague
- Q Fever
- Salmonella
- Tularemia
- Equine Encephalitis Virus
- Hemorrhagic Fever viruses
- Rift Valley Fever
- Smallpox
- Botulism
- Mycotoxins
- Staphylococcal Enterotoxin B (SEB)

Significance of These Diseases?

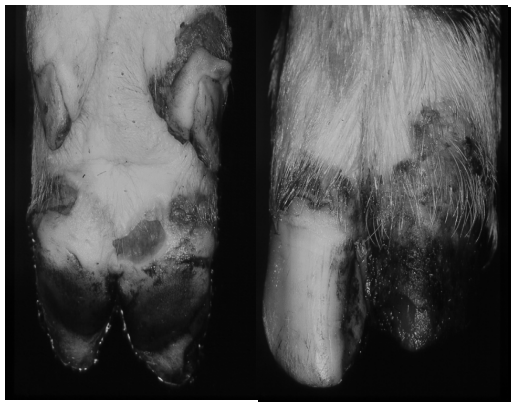
- Intimate relationship between EIDs, Zoonotic disease, BT agents, and Foreign animal diseases
  - Cross-over categorization
  - Factors
  - Implications
- "Pure science" vs "The rest"



OIE

List A

- Foot and mouth disease
- Vesicular stomatitis
- Swine vesicular disease
- Rinderpest
- Peste des petits ruminants
- Contagious bovine pleuropneumonia
- Lumpy skin disease
- Rift Valley fever
- Bluetongue
- Sheep pox and goat pox
- African horse sickness
- African swine fever
- Classical swine fever
- Highly pathogenic avian influenza
- Newcastle disease



Wheat Stem Rust
(Puccinia graminis f.sp. tritici)

- Weaponized
- Estimated $1 billion loss if introduced in Canada
- Losses of 50-90%
- Control:
  - Resistant cultivars
  - Fungicide
  - Barberry eradication and quarantine
  - Surveillance
  - Biosecurity

Transnational Factors

- Reduced public health/ veterinary influence
- Urbanization
- Ecological manipulation
- Transportation
- Globalization
- Public/media reaction
- Expansion of human, reservoir and vector populations
- Changing human susceptibility
- Microbial adaptation
- Terrorism

"Het is geen kunst om boer to worden, maar om boer to blijven."

Globalization

- International trade
  - Free trade agreements
    - ~1.9 million imported cattle
    - ~28 million imported birds
  - Increased global outbreaks
    - ~75/206 countries reported FMD in 1999
- Smuggling of products and animals
  - 4,000# meat confiscated/month in Florida from Haiti
- International travel

International travel

- #1 global growth industry
- Year 2000
  - 700 million international tourists in to the US
  - 1.3 million tourists/day in to the US

Agricultural Vulnerability

- US agricultural industry is a soft target
  - Concentrated, integrated intensive production
  - Lack of security mindset
  - Immunologically naïve populations
  - DVMs poorly trained on List A diseases
  - Depleted infrastructure
  - Limited appreciation for economic power of Ag
  - Public confidence

Terrorist Diversity

- State-sponsored terrorists
- Transnational actors
- Insurgents / rebels

Terrorist Diversity

- State-sponsored terrorists
- Transnational actors
- Insurgents / rebels
- Third position
- Doomsday cults
- Antigovernment radicals
- Religious cult extremists
- Antivivisectionists
- Environmental radicals
- Psychopaths and misfits
- Wildcards

AMERICAN THIRD POSITION

Terrorist's Intent

- Create disorder
- Terrorize, disrupt, disgrace, undermine confidence
  - Economic devastation
  - Social upheaval
  - Political instability
- Looking for IMPACT
  - Incident A: 114,000 hospitalized with 20,000 deaths
  - Incident B: 22 hospitalized with 4 deaths

Influenza '01

Anthrax '01

Terrorist's Intent

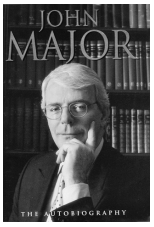
- Create political, economic, or social disorder
- Terrorize, disrupt, disgrace, undermine confidence
  - Economic devastation
  - Social upheaval
  - Political instability
- Looking for IMPACT
  - Incident A: 147,000 dead cattle in the US- 1 year
  - Incident B: 186,000 dead cattle worldwide- 19 years

Coyote predation '03

BSE, 1986-2005

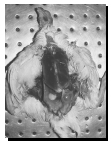
Political Impact

- United Kingdom, 1997: BSE
  - John Major's ouster



Political Impact

- United Kingdom, 1997: BSE
  - John Major's ouster
- Belgium, 1999: Dioxin
  - Coalition Government's ouster

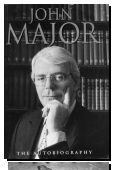


Belgium, 1999

- DIOXIN-contaminated fat
  - 80 tons recycled fat contaminated in February 1999
  - Diagnosis in April 1999
  - News released to EU 26 May 1999
  - Ouster of Coalition Government 15 July 1999
- Europe's worst health scare since BSE
- $1.5 billion lost revenue in Belgium
- Health risk
  - Immunosuppression
  - Liver and kidney failure
  - Teratogenesis and Carcinogenesis

Political Impact

- United Kingdom, 1997: BSE
  - John Major's ouster
- Belgium, 1999: Dioxin
  - Coalition Government's ouster
- United States, 2003-2004: BSE?




NATION BOZEMAN DAILY CHRONICLE, Thursday, December 25, 2003 C3

Congress twice failed to protect consumers from bad meat

"I said on the floor of the House that you

WASHINGTON (AP) — Legislation to keep meat from downed animals off

greed of the industry to make a few extra pennies from 130,000 head, the industry

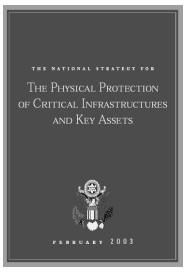
have effectively prohibited the sale of live-stock too sick or injured to stand or walk

and this is one of a number of provisions which were handled at a hearing chaired

Importance of Animal Health

The Physical Protection of Critical Infrastructures and Key Assets, Feb 2003

- Agriculture and food
- Water
- Public Health
- Emergency services
- Defense industrial base
- Telecommunications
- Energy
- Transportation
- Banking and finance
- Chemicals and HAZMAT
- Postal and shipping



HSPD-9

- Defense of United States agriculture and food, 30 Jan. '04
- National policy to defend the agriculture and food system
  - Terrorist attacks
  - Major disasters
  - Other emergencies

HSPD-9

- Policy
  - Identify and prioritize infrastructure and resources
  - Develop early warning capabilities
  - Mitigate vulnerabilities at critical nodes
  - Enhance product screening capabilities
  - Enhance response and recovery capabilities

Kosovo

- Francisella tularensis
- Nov 2001 – Feb 2002
  - 715 human cases
  - Ages 16-44
  - Relationship between failed states, refugee flow, and disease epidemics

Ag-Econ 101: The U.S. National Herd

- 96.1 million beef cattle
- 10 million dairy cattle
- 10 million sheep
- 60 million hogs
- 8 billion poultry

The Power of Agriculture

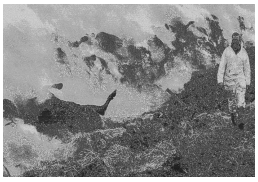
- Abundant, affordable, safe food supply
  - Americans spend <11% income on food
- Positive trade balance
  - +$12 billion USD
- 2.8 million agricultural industry workers
  - 17% of US workforce (2% producers)

The Power of Agriculture

- US beef dynamics
  - 10% of industry in exports
  - 1.65 billion# beef exported/year
  - $5.76 billion/year

FMD in the United Kingdom, 2001

- 2,030 affected farms
- >10 million animals slaughtered
- Cost of eradication: $25 billion



Superempowered Bovines

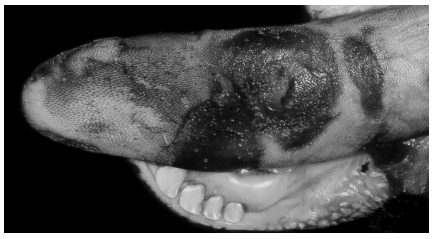
- Single animal creating social, economic, and geopolitical crisis
- Public expectations
  - Zero-defect
  - Zero-tolerance
  - Zero-risk

BSE In The US

- 1 cow imported from Canada (2003)
- 30 countries impose import bans
  - Canada
  - Mexico
  - Japan
  - South Korea
- Estimated cost: >$6 billion

Holton, Kansas

- Livestock market, March 12, 2002
- 8 cows with oral blisters



Holton, Kansas

- Veterinary response
  - Restriction of movement
  - Samples to plum island animal disease center
- Market response, March 13
  - Cattle futures dropped the limit
  - NYSE shares in food companies fell

Social Impact

- Media hysteria
- Public reaction
- Recreational activities
- Public security and safety concerns
- Erosion of confidence in food supply
- Eradication issues
  - Quarantine
  - Euthanasia
  - Disposal

85 Suicides In Farmers
In The UK
In The Wake Of FMD

C2 Toxin

Great Falls Tribune online — Covering Great Falls and northcentral Montana

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Local News - Friday, September 5, 2003

SUBSCRIBE TO THE GREAT FALLS TRIBUNE

Gibson Pond tainted

Officials blame bird deaths on botulism

By SONJA LEE
Tribune Staff Writer

Officials believe avian botulism is to blame for the deaths of more than 20 birds at Gibson Park, and they plan immediate action.

To clear out the disease, the Great Falls Parks and Recreation Department will herd up the ducks and geese today and put them in a winter pen. Gibson Pond will be drained and may be excavated.

TRIBUNE PHOTO BY WAYNE ARNST

U.S. & World News — The Topeka Capital-Journal

Last modified at 12:54 a.m. on Friday, March 2, 2001

Disease may claim St. Patrick's Day

By LAURA KING
Associated Press

LONDON -- It is an animal ailment, but these days, hardly a person living in the British Isles is unaffected by the nationwide outbreak of foot-and-mouth disease.

In the latest round of cancellations and curtailments meant to stem the spread of the highly contagious livestock virus, organizers on Thursday

S.Korea: Foot-And-Mouth Won't Disrupt World Cup

May 21, 2002 02:52 AM ET Email this article Printer friendly version

By Cho Mee-young

SEOUL (Reuters) - South Korea said on Tuesday an outbreak of foot-and-mouth was under control as World Cup and tourism officials played down fears the disease would cause major disruption for visitors to the soccer World Cup.

More than 110,000 animals, mainly pigs and cows, have now been culled in affected areas and buried in sealed pits, officials of the agriculture ministry said.

"The current foot-and-mouth situation is under government control," Agriculture Minister Kim Dong-tae told foreign correspondents. "The outbreak of foot-and-mouth will not cause any inconvenience to visitors or World Cup matches," he added.

Foot-and-mouth is highly contagious and can be fatal to animals

Military Issues

- **Capabilities**
  - **Professional**
  - **Cleaning and disinfection**
  - **Depopulation and disposal**
  - **Heavy equipment**
  - **Command, control, communications and computers (C4)**
  - **Transportation**
  - **Restriction of movement**

Military Issues

- **Limitations**
  - **Legal**
    - **USC Title 18, Posse Comitatus Act**
    - **USC Title10 Chapter 15, Insurrection Act**
  - **Timing**
  - **Resources…**

S.Korea: Foot-And-Mouth Won't Disrupt World Cup

EMERGING INFECTIOUS DISEASES
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Letter

Nipah Virus Infection Among Military Personnel Involved in Pig Culling during an Outbreak of Encephalitis in Malaysia, 1998-1999

Why Not Target U.S. Agriculture?

- Symbols of American power and arrogance
- The character of the terrorist's statement
- But… consider the impact on our social, economic and diplomatic instruments of power

Final Thoughts

- Terrorism is just one of many threats to the agricultural industry
- Our preparedness efforts must be
  - Integrated
  - Multi-hazard
  - Capabilities-based

"Governments will no longer be judged on whether or not they have incursions of FADs, but rather on how they respond to them."
Alex Thierman, OIE, 2001

Upcoming Programs

Biosecurity: Perception is Not Reality - The Need for a New Paradigm
Tuesday, August 30, 2005
12:00 - 1:30 p.m. (Central Time)

For complete listing of upcoming programs visit: www.adph.org/alphtn